

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A distributed storage management platform architecture comprising:  
a plurality of storage routers, wherein  
each one of said storage routers comprises a plurality of interface controllers, and  
a one of said interface controllers of said each one of said storage routers is communicatively coupled to a one of said interface controllers of at least one other of said storage routers.
2. (New) A distributed storage management platform architecture comprising:  
a plurality of storage network interface devices; and  
a plurality of multi-port controllers, wherein  
each of said multi-port controllers comprises a plurality of ports,  
each of said storage network interface devices comprises at least one of said multi-port controllers,  
a port of a first multi-port controller of a first one of said storage network interface devices is coupled to a port of a second multi-port controller of a second of said storage network interface devices,  
and  
said first and said second ones of said storage network interface devices are communicatively coupled to one another by said first multi-port controller and said second multi-port controller.
3. (New) The apparatus of claim 2, wherein said multi-port controllers are coupled to form a storage area network (SAN).
4. (New) The apparatus of claim 3, further comprising:  
a host computer; and  
a storage subsystem, wherein  
said multi-port controllers are coupled to form a storage area network, and

said host computer and said storage subsystem are communicatively coupled to one another by said storage area network.

5. (New) The apparatus of claim 4, further comprising:  
management software residing on said host computer, wherein used to configure a relationship between said host computer and said storage subsystem.

6. (New) The apparatus of claim 3, wherein said first and said second ones of said storage network interface devices are communicatively coupled to one another via an in-band link.

7. (New) The apparatus of claim 6, wherein  
said in-band link is one of a plurality of in-band links,  
each of said storage network interface devices is communicatively coupled to another of said storage network interface devices by at least one of said links,  
said storage network interface devices and said links are configured to support communication of SAN management information, and  
said SAN is an intelligent SAN as a result of said communication of SAN management information.

8. (New) The apparatus of claim 6, wherein said first and said second ones of said storage network interface devices are further communicatively coupled to a secondary network.

9. (New) The apparatus of claim 8, wherein  
said in-band link is one of a plurality of in-band links,  
each of said storage network interface devices is communicatively coupled to another of said storage network interface devices by at least one of said links, and  
said secondary network is independent of said in-band links.

10. (New) The apparatus of claim 9, wherein  
said storage network interface devices are configured to communicate with one  
another via said secondary network as an alternative for communications  
with said one another via said in-band links, in an event of a failure of at  
least one of said in-band links.
11. (New) The apparatus of claim 9, further comprising:  
a host computer, communicatively coupled to said secondary network, wherein  
said storage network interface devices are configured to communicate  
with said host computer via said secondary network.
12. (New) The apparatus of claim 3, wherein  
said SAN comprises a backbone,  
said backbone is formed by a SCSI upper-layer protocol and a fibre channel  
lower-layer protocol.
13. (New) The apparatus of claim 12, wherein  
said lower-layer protocol is a transport layer protocol, and  
message communication and data input/output signals are  
conveyed using said transport layer protocol.
14. (New) The apparatus of claim 2, wherein  
a one of said storage network interface devices comprises a plurality of said  
multi-port controllers, wherein  
a host-side multi-port controller of said plurality of said multi-port  
controllers is dedicated to host-side connections, and  
a storage-side multi-port controller of said plurality of said multi-port  
controllers is dedicated to storage-side connections.
15. (New) The apparatus of claim 14, wherein each of said multi-port  
controllers is a dual port controller.

16. (New) The apparatus of claim 14, wherein a port of said storage-side multi-port controller is communicatively coupled to a port of a storage-side multi-port controller of another of said storage network interface devices.

17. (New) The apparatus of claim 16, wherein said storage-side multi-port controller and said storage-side multi-port controller of another of said storage network interface devices are communicatively coupled to one another via an in-band link.

18. (New) The apparatus of claim 14, wherein a port of said host-side multi-port controller is communicatively coupled to a port of a host-side multi-port controller of another of said storage network interface devices.

19. (New) The apparatus of claim 18, wherein said host-side multi-port controller and said host-side multi-port controller of another of said storage network interface devices are communicatively coupled to one another via an in-band link.

20. (New) The apparatus of claim 14, wherein each of said storage network interface devices is a storage network router.

21. (New) The apparatus of claim 20, wherein said each of said storage network routers operates according to instructions in firmware residing in a memory of said each of said storage network routers.

22. (New) The apparatus of claim 14, wherein each of said storage network interface devices is a storage virtualization engine (SVE).

23. (New) The apparatus of claim 22, wherein said each of said SVEs operates according to instructions in firmware residing in a memory of said each of said SVEs.

24. (New) The apparatus of claim 14, wherein each of said storage network interface devices is a storage network appliance.

25. (New) The apparatus of claim 24, wherein said each of said storage network appliances operates according to instructions in firmware residing in a memory of said each of said storage network appliances.

26. (New) A distributed storage management platform comprising:  
a plurality of storage interface devices, wherein  
each one of said storage interface devices comprises a plurality of  
interface controllers, and  
a one of said interface controllers of each one of said storage interface  
devices is communicatively coupled to a one of said interface  
controllers of at least one other of said storage interface devices.

27. (New) The apparatus of claim 26, wherein  
each of said storage interface devices is a storage router, and  
each of said interface controllers is a multi-port controller.

28. (New) The apparatus of claim 27, wherein said storage routers are  
coupled to form a storage area network (SAN).

29. (New) The apparatus of claim 28, wherein said multi-port controllers are  
coupled to form said SAN.

30. (New) The apparatus of claim 28, wherein each of said storage routers is a  
storage virtualization engine (SVE).

31. (New) The apparatus of claim 28, wherein  
a port of a first multi-port controller of a first one of said storage routers is  
coupled to a port of a second multi-port controller of a second of said  
storage routers, and

said first and said second ones of said storage routers are communicatively coupled to one another by said first multi-port controller and said second multi-port controller.

32. (New) The apparatus of claim 28, further comprising:

a host computer; and

a storage subsystem, wherein

said multi-port controllers are coupled to form a storage area network, and

said host computer and said storage subsystem are communicatively

coupled to one another by said storage area network.

33. (New) The apparatus of claim 28, wherein, for each of said storage

routers,

a host-side multi-port controller of said multi-port controllers of said each of said

storage routers is dedicated to host-side connections, and

a storage-side multi-port controller of said multi-port controllers of said each of

said storage routers is dedicated to storage-side connections.

34. (New) The apparatus of claim 33, wherein each of said multi-port

controllers is a dual port controller.

35. (New) The apparatus of claim 33, wherein

a first storage-side multi-port controller is communicatively coupled to a second

storage-side multi-port controller, wherein

a first one of said storage routers comprises said first storage-side multi-port controller,

a second one of said storage routers comprises said second storage-side multi-port controller, and

said first and said second storage-side multi-port controllers are ones of said storage-side multi-port controllers.

36. (New) The apparatus of claim 35, wherein said first and said second storage-side multi-port controllers are communicatively coupled to one another via an in-band link.

37. (New) The apparatus of claim 33, wherein  
a first host-side multi-port controller is communicatively coupled to a second host-side multi-port controller, wherein  
a first one of said storage routers comprises said first host-side multi-port controller,  
a second one of said storage routers comprises said second host-side multi-port controller, and  
said first and said second host-side multi-port controllers are ones of said host-side multi-port controllers.

38. (New) The apparatus of claim 37, wherein said first and said second host-side multi-port controllers are communicatively coupled to one another via an in-band link.

39. (New) The apparatus of claim 28, wherein  
said SAN comprises a backbone,  
said backbone is formed by a SCSI upper-layer protocol and a fibre channel lower-layer protocol.

40. (New) The apparatus of claim 39, wherein each of said multi-port controllers is a dual port controller.

41. (New) The apparatus of claim 39, wherein a first one and a second one of said storage routers are communicatively coupled to one another via an in-band link.

42. (New) The apparatus of claim 41, wherein  
said in-band link is one of a plurality of in-band links,

each of said storage routers is communicatively coupled to another of said storage routers by at least one of said links, and said storage routers and said links are configured to support communication of SAN management information.

43. (New) The apparatus of claim 41, wherein said first and said second ones of said storage routers are further communicatively coupled to a secondary network.

44. (New) The apparatus of claim 43, wherein said in-band link is one of a plurality of in-band links, each of said storage routers is communicatively coupled to another of said storage routers by at least one of said links, and said secondary network is independent of said in-band links.

45. (New) The apparatus of claim 44, wherein said storage routers are configured to communicate with one another via said secondary network concurrently with communicating with said one another via said in-band links.

46. (New) The apparatus of claim 45, further comprising: a host computer, communicatively coupled to said secondary network, wherein said storage routers are configured to communicate with said host computer via said secondary network.

47. (New) The apparatus of claim 45, wherein said storage routers are configured to communicate with one another via said secondary network, in an event of a failure of at least one of said in-band links.

48. (New) An distributed storage management comprising: a storage virtualization engine (SVE).

49. (New) The apparatus of claim 48, wherein



said SVE comprises a plurality of multi-port controllers.

50. (New) The apparatus of claim 48, wherein each of said multi-port controllers is a dual-port Fibre Channel controller having a first port and a second port.

51. (New) The apparatus of claim 49, wherein at least one of said multi-port controllers is configured to communicatively couple said SVE to another SVE.

52. (New) The apparatus of claim 51, wherein said at least one of said multi-port controllers is configured to be communicatively coupled to a multi-port controller of said another SVE.

53. (New) The apparatus of claim 49, further comprising: a storage subsystem, wherein at least one of said multi-port controllers is coupled to said storage subsystem.


54. (New) The apparatus of claim 49, further comprising: a host computer, wherein at least one of said multi-port controllers is coupled to said host computer.

55. (New) The apparatus of claim 49, further comprising: a plurality of SVEs, wherein said SVE is one of said SVEs.

56. (New) The apparatus of claim 48, wherein each of said multi-port controllers of each of said SVEs is a dual-port Fibre Channel controller having a first port and a second port, and a second port of at least one multi-port controller of one of said SVEs is coupled to a second port of at least one multi-port controller of one other of said SVEs.

57. (New) The apparatus of claim 55, wherein  
at least one of said multi-port controllers of said SVE is communicatively coupled  
to a multi-port controller of one of said SVEs.

58. (New) The apparatus of claim 55, further comprising:  
a storage subsystem, wherein  
at least one of said multi-port controllers of said SVE is coupled to said  
storage subsystem.

 59. (New) The apparatus of claim 58, further comprising:  
a switch, wherein said switch is configured to couple said storage subsystem to  
said at least one of said multi-port controllers of said SVE.

60. (New) The apparatus of claim 55, further comprising:  
a host computer, wherein  
at least one of said multi-port controllers of said SVE is coupled to said  
host computer.

61. (New) The apparatus of claim 60, further comprising:  
a switch, wherein said switch is configured to couple said host computer to said at  
least one of said multi-port controllers of said SVE.

62. (New) The apparatus of claim 55, wherein  
each of said SVEs is communicatively coupled to at least one other of said SVEs.

63. (New) The apparatus of claim 62, wherein said each of said SVEs is  
communicatively coupled to said at least one other of said SVEs by virtue of at least one  
of said multi-port controllers of said each of said SVEs being communicatively coupled  
to a multi-port controller of said at least one other of said SVEs.

64. (New) The apparatus of claim 62, further comprising:  
a secondary network, wherein

at least one of said SVEs is communicatively coupled to said secondary network.

65. (New) The apparatus of claim 64, wherein  
a plurality of said SVEs are communicatively coupled to said secondary network,  
and  
said plurality of said SVEs communicate with one another using said secondary network.

66. (New) The apparatus of claim 62, wherein said SVEs are coupled to form a storage area network (SAN).

67. (New) The apparatus of claim 66, wherein said multi-port controllers are coupled to form said SAN.

68. (New) The apparatus of claim 66, wherein  
a port of a first multi-port controller of a first one of said SVEs is coupled to a  
port of a second multi-port controller of a second of said SVEs, and  
said first and said second ones of said SVEs are communicatively coupled to one  
another by said first multi-port controller and said second multi-port  
controller.

69. (New) The apparatus of claim 66, further comprising:  
a host computer; and  
a storage subsystem, wherein  
said multi-port controllers are coupled to form a storage area network, and  
said host computer and said storage subsystem are communicatively  
coupled to one another by said storage area network.

70. (New) The apparatus of claim 69, wherein  
a host-side switch, wherein said host-side switch is configured to couple said host  
computer to said at least one of said SVEs, and

a storage-side switch, wherein said storage-side switch is configured to couple said storage subsystem to said at least one of said SVEs.

71. (New) The apparatus of claim 66, wherein, for each of said SVEs, a host-side multi-port controller of said multi-port controllers of said each of said SVEs is dedicated to host-side connections, and a storage-side multi-port controller of said multi-port controllers of said each of said SVEs is dedicated to storage-side connections.

72. (New) The apparatus of claim 71, wherein each of said multi-port controllers is a dual port controller.

73. (New) The apparatus of claim 71, wherein a first storage-side multi-port controller is communicatively coupled to a second storage-side multi-port controller, wherein a first one of said SVEs comprises said first storage-side multi-port controller, a second one of said SVEs comprises said second storage-side multi-port controller, and said first and said second storage-side multi-port controllers are ones of said storage-side multi-port controllers.

74. (New) The apparatus of claim 73, wherein said first and said second storage-side multi-port controllers are communicatively coupled to one another via an in-band link.

75. (New) The apparatus of claim 71, wherein a first host-side multi-port controller is communicatively coupled to a second host-side multi-port controller, wherein a first one of said SVEs comprises said first host-side multi-port controller,

a second one of said SVEs comprises said second host-side multi-port controller, and  
said first and said second host-side multi-port controllers are ones of said host-side multi-port controllers.

76. (New) The apparatus of claim 75, wherein said first and said second host-side multi-port controllers are communicatively coupled to one another via an in-band link.

77. (New) The apparatus of claim 66, wherein  
said SAN comprises a backbone,  
said backbone is formed by a SCSI upper-layer protocol and a fibre channel lower-layer protocol.

78. (New) The apparatus of claim 77, wherein each of said multi-port controllers is a dual port controller.

79. (New) The apparatus of claim 77, wherein a first one and a second one of said SVEs are communicatively coupled to one another via an in-band link.

80. (New) The apparatus of claim 79, wherein  
said in-band link is one of a plurality of in-band links,  
each of said SVEs is communicatively coupled to another of said SVEs by at least one of said links, and  
said SVEs and said links are configured to support communication of SAN management information.

81. (New) The apparatus of claim 79, wherein said first and said second ones of said SVEs are further communicatively coupled to a secondary network.

82. (New) The apparatus of claim 81, wherein  
said in-band link is one of a plurality of in-band links,

each of said SVEs is communicatively coupled to another of said SVEs by at least one of said links, and  
said secondary network is independent of said in-band links.

83. (New) The apparatus of claim 82, wherein  
said SVEs are configured to communicate with one another via said secondary network concurrently with communicating with said one another via said in-band links.

84. (New) The apparatus of claim 83, further comprising:  
a host computer, communicatively coupled to said secondary network, wherein  
said SVEs are configured to communicate with said host computer via  
said secondary network.

85. (New) The apparatus of claim 83, wherein  
said SVEs are configured to communicate with one another via said secondary network, in an event of a failure of at least one of said in-band links.

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